REMARKS

Claims 1-6 were pending in the application and were rejected. Claims 1-6 are herein amended.

Article 19 Amendments

From the statement in the last paragraph of page 3 of the Office Action "...the limitation 'for a non-viral gene delivery sector' is functional language ... ", it appears that the U.S.P.T.O. is not examining the claims as amended in the Article 19 Amendments. The U.S.P.T.O. electronic file wrapper has an entry labeled "claims" which contains the original claims and the Article 19 amended claims.

In view of the above, Applicant respectfully requests that the U.S.P.T.O. consider the Article 19 amended claims. For clarity, Applicant herewith submits a clean copy of the claims including the Article 19 amendments.

Objections to the Claims

Claims 1-4 are objected to as allegedly containing "informalities."

The Office Action states that in the description of R_7 semicolons are used to separate the members of the group rather than commas. In response, Applicant herein amends claims 1-4 to correct for this and other informalities. Favorable reconsideration is respectfully requested.

Applicant's Response to Claim Rejections under 35 U.S.C. §102

Claims 1 and 2 were rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Onishi (US Pat. 4,816,540).

It is the position of the Office Action that that Onishi discloses Applicant's claimed copolymers and that the functional language "for a non-viral gene delivery sector" does not materially change the structure of the polymer.

The Office Action considers the cationic graft-copolymers of Onishi to fully encompass Applicant's claims 1 and 2. That is, the Office Action's position is that the cationic graft-copolymers of Onishi meet the recited cationic graft-copolymers and that such cationic graft-copolymers also inherently would be capable of the claimed function of being a non-viral gene delivery vector.

In response, Applicant herein amends claims 1 and 2 in order to recite "a non-viral gene delivery vector formed of an aqueous solution of a cationic graft-copolymer..." Onishi does not disclose or suggest such an aqueous solution. Favorable reconsideration is respectfully requested.

Applicant's Response to Claim Rejections under 35 U.S.C. §103

Claims 3-6 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Onishi (US Pat. 4,816,540) in view of Pack, Gene-Delivery Polymers.

It is the position of the Office Action that Onishi discloses the invention as claimed, wit the exception of teaching forming a complex with DNA. The Office Action cites Pack as teaching forming a complex between a cationic graft polymer and DNA (Section 2.2.2).

Onishi claims a cationic graft-copolymer, useful as a micro carrier for cell cultivation, comprising a unit derived from a cationic polysaccharide whereas the present invention claims a cationic graft-copolymer of a water-soluble linear backbone polymer having hydroxyl groups comprising a unit derived from a cationic a water-soluble linear

polysaccharide. Although both the inventions are directed at a cationic graft-copolymer, Onishi does not disclose or teach or suggest any possibility for a non-viral gene delivery vector by the graft copolymer. Also, a person having ordinary skill in the art would not have been prompted to make use of a cationic water-soluble linear polysaccharide in the preparation of cationic graft-copolymer.

Though the Office Action cites Pack (Gene-delivery polymers) as teaching forming a complex between a cationic graft polymer and DNA (Section 2.2.2), Pack also shows that the polymers are not copolymers, but rather homopolymers by the characterization that the polymers themselves comprise linear, branched, and dendrimeric structures. On the other hand, a cationic graft-copolymer of this invention is characterized as copolymer having a hydrophilic-hydrophobic micro-separated-domain as shown in the specification.

In section 2.2 Pack also shows various synthetic vector, including DEAE-dextran of a starting material for this invention, has suffered from problems including toxicity, low gene transfer efficiency, and *in vivo* instability.

It would not have been obvious that a cationic graft-copolymer obtained by graft-polymerizing methyl methacrylate of an olefin monomer onto DEAE-dextran of a cationic derivative of a water-soluble linear polymer having hydroxyl groups can solve these problems, especially of toxicity and low gene transfer efficiency. Samples 1 having a 150% weight increase, 2 having a 200% weight increase and 3 having a 300% weight increase were prepared following procedure of Example 1.

With the transfection efficiency, transfection activity was determined using the X-gal staining (β-galactosidase activities in tissue) method and a value 3 times higher was confirmed for sample 1 and sample 2 than for the starting DEAE-dextran hydrochloride.

Formation of a complex between nucleic acids (DNA or RNA) and cationic graft-copolymers, such as DEAE-dextran-MMA copolymer, is improved as compared with DEAE-dextran of the starting material.

In these Examples, a complex of sample 1 between DNA and DEAE-dextran-MMA-Copolymer hydrochloride having a 150% weight increase was formed in 2 hours. A complex of sample 2 and sample 3 between DNA and DEAE-Dextran-MMA-copolymer hydrochloride having a 200% and 300% weight increase were formed in 1 hour and 0.5 hours, respectively. However, a complex between DNA and DEAE-dextran hydrochloride was formed in 96 hours.

Additionally, Applicant herewith submits experimental data which shows that the efficacy/transfection efficiency of the claimed non-viral gene delivery vector comprising of the graft copolymer compared with a prior known vector. Accordingly, Applicant respectfully submits that the attached data is sufficient to prove the higher efficacy/efficiency of a transfection with the graft copolymer by comparison of a starting material.

Specifically, Applicant submits the data of Example 1(DDMC) compared to PolyFect Reagent (QIAGEN GmbH) having dendrimeric structures shown in Section 2.2.2 of Pack (Gene-delivery polymers). The data is for the transfection for COS7 cells by pGL3DNA/DDMC. The cells were ready to harvest 72 hours after transfection, and were assayed for luciferase activity.

Accordingly, in view of the above remarks and the cited art, Applicant respectfully submits that the claimed gene delivery of polymers would not have been obvious to one having ordinary skill in the art. Favorable reconsideration is respectfully requested.

Applicant's Response to Double Patenting Rejections

Claims 1 and 2 were rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claim 1 of U.S. Patent No. 4,816,540.

Claims 3-6 were rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claim 1 of U.S. Patent No. 4,816,540 in view of Pack, Gene-Delivery Polymers.

In response, Applicant respectfully submits that since the §102 and §103 rejections are overcome on the technical merits, the obviousness-type double patenting rejections are also overcome. Favorable reconsideration is respectfully requested.

Conclusion

In view of the aforementioned amendments and accompanying remarks, Applicant submits that the claims, as herein amended, are in condition for allowance. Applicant requests such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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Enclosure: Clean copy of Article 19 Amendments corresponding to claims 1-4
Declaration under 37 CFR 1.132